THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 23

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DAVID R. HUBER

Appeal No. 96-3896
Application No.08/152,315[1]

ON BRIEF

Before URYNOWICZ, THOMAS, and CARMICHAEL, Administrative Patent Judges.

URYNOWICZ, Administrative Patent Judge.

DECISION ON APPEAL

This appeal is from the final rejection of claims 6 and 8, all the claims pending in the application.

Claim 6 defines an optical multiplexer and claim 8 defines an optical demultiplexer. Claims 6 and 8 read as follows:

An optical multiplexer for multiplexing optical signals having different wavelengths comprising:

an optical circulator having at least three circulator ports (1, 2, 3) for circulating optical signals from one port to the next port in a circulating direction;

means for coupling a first optical signal at a first wavelength (ë$_j$) to a first of said circulator ports (1);

an in-fiber Bragg grating reflector for reflecting substantially only said first optical signal at said first wavelength (ë$_j$);

means for coupling said in-fiber Bragg grating reflector to a second of said circulator ports (2) which is the next circulator port in the circulating direction from said first circulator port (1) for reflecting said first optical signal at said first wavelength (ë$_j$) back to said second circulator port (2);

means for coupling a multiplexed optical signal ë$_{k,}$ the multiplexed signal ë$_k$ comprising a group of optical signals, each at a different wavelength, wherein the multiplexed optical signal ë$_k$ does not include an optical signal at a wavelength of ë$_i$ to said in-fiber Bragg grating reflector for transmission to said second circulator port (2); and

both of said optical signals being circulated from said second circulator port (2) to said third circulator port (3) which is the next port in the circulating direction so that a combined multiplexed output of said optical signals is coupled from said third circulator port (3).

8. An optical demultiplexer for demuliplexing [sic] an input signal containing a group of signals each at a different wavelength (ë$_k$ = ë$_1$, ë$_2$ . . . ë$_j$) into at least two optical signals comprising:

an optical circulator having at least three circulator ports (1, 2, 3) for circulating optical signals from one port to the next port in a circulating direction;

means for coupling said input signal comprising a group of signals each at a different wavelength (ë$_k$) to a first of said circulator ports (1);

an in-fiber Bragg grating reflector for reflecting substantially only a desired one of said optical signals at a first wavelength (ë$_j$);

means for coupling said in-fiber Bragg grating reflector to a second of said circulator ports (2) which is the next circulator port in the circulating direction from said first circulator port (1) for reflecting said desired one of said optical signals at a first wavelength (ë$_j$) back to said second circulator port (2);

said desired one of said two optical signals at a first wavelength (ë$_j$) being circulator from said second circulator port (2) to said third circulator port (3) which is the next port in the circulating direction so that the demultiplexed output of said desired one of said optical signals at a desired wavelength (ë$_j$) is coupled from said third circulator port (3).

The references relied upon by the examiner as evidence of obviousness are:

DeLange	3,676,684	Jul. 11, 1972
Hepner et al. (Hepner)	4,221,460	Sep. 09, 1980
Glomb et al. (Glomb)	5,077,816	Dec. 31, 1991

The appealed claims stand rejected as under 35 U.S.C. ' 103 as being unpatentable over Hepner or DeLange in view of Glomb.

The respective positions of the examiner and the appellant with regard to the propriety of these rejections are set forth in the final rejection (Paper No. 14) and the examiner's answer (Paper No. 22) and the appellant's brief (Paper No. 21).

Appellant's Invention

The invention relates to optical multiplexers and demultiplexers which use Bragg grating reflectors to select optical channels in wavelength division multiplexed optical communication systems. In the multiplexer of Figure 2, a three-port optical circulator 36 circulates optical signals from one port to the next port. For example, optical signals which enter port 1 exit at port 2, and optical signals which enter port 2 exit at port 3. An optical signal having a first wavelength ë$_j$ is coupled to circulator port 1 at input 30. This signal exits circulator 36 through circulator port 2. The exiting optical signal encounters an in-fiber Bragg grating reflector 38 and is reflected back through circulator port 2. A multiplexed optical signal ë$_k$ is coupled at input 32 to the reflector 38 for transmission into circulator port 2. The multiplexed signal ë$_k$ comprises a group of optical signals, each at a different wavelength. The multiplexed optical signal ë$_k$ and the optical signal ë$_j$ are circulated from circulator port 2 to circulator port 3, creating a multiplexed output optical signal comprised of ë$_j$ and ë$_k$ on output path 34.

In the demultiplexer of Figure 3, a three-port optical circulator 36 circulates optical signals from one port to the next. That is, optical signals which enter port 1 exit at port 2 and optical signals which enter port 2 exit at port 3. A Bragg grating reflector 46 selects an optical channel to be removed from the optical system. A multiplexed optical signal ë$_k$ comprised of a group of signals is coupled to circulator port 1 through input path 42. Reflector 46 reflects an optical wavelength ë$_j$. The multiplexed optical signal input at port 1 exits the optical circulator at port 2. The optical wavelength ë$_j$ is reflected by the Bragg grating and re-enters the optical circulator through port 2. The remaining wavelengths of the multiplexed optical signal are transmitted through grating reflector 46 to output 48. The demultiplexed optical signal ë$_j$ is circulated from circulator port 2 to circulator port 3 where it exits onto output 44.

The Prior Art

In Figure 2, DeLange discloses an optical multiplexer comprising a plurality of branches 1-N, each of which selectively isolates and modulates one of a plurality of carrier signals F_1-F_N input at ports 1 of discriminators 11. The modulated signals are either reflected at filters F to rejoin the unmodulated carriers or they are separated at the filters and combined in a separate output circuit comprising modulators 14. A demulti-plexer (Figure 5) selectively isolates modulated carriers by means of a network similar to the multiplexer, and demodulates them in turn.

In Figure 4, Hepner discloses an optical multiplexer for multiplexing two optical signals having wavelengths $\ddot{e}_1$ and $\ddot{e}_2$ input at terminals 1 and 2, respectively. Filter 12 is selected to transmit the signal having $\ddot{e}_2$ and to reflect the signal having $\ddot{e}_1$. The signal at 1 ($\ddot{e}_1$) passes through separator 8, the rotator 9 and half-wave plate 4. It is reflected by filter 12, passes through plate 4, rotator 9, separator 8, plate 6 to output terminal 3. The signal at 2 ($\ddot{e}_2$) passes through filter 12 and takes the same path as $\ddot{e}_1$ to output terminal 3.

For demultiplexing, two carrier signals having wavelength $\ddot{e}_1$ and $\ddot{e}_2$ are input at terminal 1. These signals pass through separator 8, rotator 9 and the half-wave plate 4. Filter 12 reflects the carrier wavelength $\ddot{e}_1$ and transmits the carrier wave of $\ddot{e}_2$ to line 2. The carrier signal of wavelength $\ddot{e}_1$ is thus obtained at the output end of the filter on line 3. When reflected, carrier $\ddot{e}_1$ is passed back through the half-wave plate 4 and the rotator 9. The separator 8 deflects the signal, which then passes through half-wave plate 6 to output line 3.

Glomb teaches optical communication devices utilizing Bragg grating elements. As illustrated in Figure 2, such elements have wide frequency pass bands on each side of a narrow reflection band 22.

Opinion

After consideration of the positions and arguments presented by both the examiner and the appellant, we have concluded that the rejection of claims 6 and 8 over DeLange in view of Glomb should not be sustained, that the rejection of claim 6 over Hepner in view of Glomb should not be sustained but that the rejection of claim 8 over Hepner in view of Glomb should be sustained.

With respect to the rejection of claims 6 and 8 over DeLange and Glomb, the filters 13 and 32 of DeLange=s device, Figures 2 and 5, respectively, pass a single wavelength and reflect all others. In contrast, the Bragg grating filter of Glomb, having a narrow stopband 22, passes most wavelengths and reflects a narrow band of wavelengths. Such being the case, there is no motivation to substitute the Bragg grating filter of Glomb for each of the filters disclosed in DeLange because with the Bragg grating filters disclosed in Glomb, DeLange could no longer function to reflect all but one frequency at each filter as intended. Thus, with the Bragg grating filter of Glomb substituted in DeLange, DeLange could not function in the manner disclosed.

As to the rejection of claim 6 over Hepner and Glomb, it is considered that the substitution of the Bragg grating filter for the filter in Hepner would have been obvious to one of ordinary skill in the art at the time the invention was made. Hepner=s filter 12, Figure 4, operates to pass a wavelength and reflect a second, different wavelength. The Bragg grating of Glomb is disclosed at column 5, lines 17-38, and at Figure 2, and it is apparent that it reflects a wavelength within stopband 22 and passes any wavelength outside of the stopband. Thus, the fact that the grating would have served as a full substitute for Hepner=s filter is apparent. Section 103 requires us to presume that the artisan has full knowledge of the prior art in his field of endeavor and the ability to select and utilize knowledge from analogous arts. In re Deminski, 796 F.2d 436, 442, 230 USPQ 313, 315

(Fed. Cir. 1986). Nevertheless, the combination does not result in the claimed invention. Hepner does not disclose means for coupling a group of optical signals ë$_k$ to a second circulator port as recited in claim 6 and it has not been established why it would have been obvious to one of ordinary skill in the art to modify the combined teachings of the prior art so as to utilize such a group of signals for the single wavelength signal applied to the second circulator port of Hepner.

Claim 8 requires no more than two optical signals and thus, does not distinguish over the combination of Hepner and Glomb. The two signals of claim 8 are met by the two signals having wavelengths ë$_1$ and ë$_2$ applied at circulator port 1 in Figure 4 of Hepner in the demultiplexing of the two signals disclosed at column 4, line 58 through column 5, line 6.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR ' 1.136(a).

AFFIRMED-IN-PART

STANLEY M. URYNOWICZ, JR. Administrative Patent Judge	)
JAMES D. THOMAS Administrative Patent Judge	) BOARD OF PATENT APPEALS AND INTERFERENCES
JAMES T. CARMICHAEL Administrative Patent Judge	)

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[1] Application for patent filed November 15, 1993. According to appellant, this application is a Division of Application 07/919,823 filed July 27, 1992, now U.S. Patent No. 5,283,686 issued February 1, 1994.